Focus Area– Topic E

Multiplication of a Fraction by a Fraction

Solve. Draw a model to explain your thinking.
Joseph has \(\frac{1}{4}\) of a pound of strawberries. He gave his teacher \(\frac{1}{5}\) of the strawberries. What fraction of strawberries did Joseph give to his teacher?

Think: We need to find \(\frac{1}{5}\) of \(\frac{1}{4}\) strawberries.

**Step 1:** Draw a rectangle and cut it vertically into 4 equal parts. Shade 1 part and label it \(\frac{1}{4}\).

**Step 2:** We need to find \(\frac{1}{5}\) of \(\frac{1}{4}\). Split the whole rectangle into 5 equal parts by drawing horizontal lines. Now, shade 1 of the 5 parts (that are already shaded) and label it \(\frac{1}{5}\).

How many units make our whole? 20

Joseph gave his teacher \(\frac{1}{20}\) of the strawberries.

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**Objective of Topic E**

- Multiply unit fraction by unit fractions.
- Multiply unity fractions by non-unit fractions.
- Multiply non-unit fractions by non-unit fractions.
- Solve word problems using tape diagrams and fractions-by-fraction multiplications.
- Relate decimal and fraction multiplication.
- Convert measures involving whole numbers, and solve multi-step word problems.
- Convert mixed unit measurements, and solve multi-step word problems.
Solve. Draw a model to explain your thinking.

Of the students on Nia’s track team, \(\frac{3}{5}\) participate in running events. Of the students who participate in running events, \(\frac{2}{3}\) are in the relay race. What fraction of the students on the track team ran in the relay race?

**Think: We need to find \(\frac{2}{3}\) of \(\frac{3}{5}\)**

**Step 1:** Draw a rectangle and cut it vertically into 5 equal parts. Shade 3 parts and label it \(\frac{3}{5}\).

**Step 2:** Split the rectangle into 3 equal parts by drawing horizontal lines. Now shade 2 of the 3 parts (that are already shaded) and label it \(\frac{2}{3}\).

How many units make our whole? 15

What’s the name of these units? Fifteenths

\[\frac{2}{3} \text{ of } \frac{3}{5} = \frac{6}{15} \rightarrow \frac{2}{3} \times \frac{3}{5} = \frac{6}{15}\]

\(\frac{6}{15}\) or \(\frac{2}{5}\) of the students ran on the relay race.

**Method 1:** Students will eventually see a pattern and multiply numerator times numerator and denominator times denominator.

\[\frac{2}{5} \times \frac{10}{12} = \frac{2 \times 10}{5 \times 12} = \frac{20}{60} = \frac{1}{3}\]

**Method 2:** Students divide by common factors prior to multiplying.

\[\frac{2}{5} \times \frac{10}{12} = \frac{\cancel{2} \times \cancel{10}}{\cancel{5} \times \cancel{12}} = \frac{2}{6} = \frac{1}{3}\]

A common factor of 2 and 12 is 2.
A common factor of 10 and 5 is 5.

**Solve Word Problems Using a Tape Diagram:**

Dell has 14 blue marbles. His blue marbles make up \(\frac{2}{5}\) of his total number of marbles. How many marbles does Dell have?

\[2 \text{ units} = 14\]
\[1 \text{ unit} = \frac{14}{2} = 7\]
\[5 \text{ units} = 5 \times 7 = 35\]

(Dell has 35 marbles.)

**Relate decimal and fraction multiplication**

**Example A:**

\[0.5 \times 0.3 \rightarrow \frac{5}{10} \times \frac{3}{10} = \frac{5 \times 3}{10 \times 10} = \frac{15}{100} = 0.15\]

**Example B:**

\[2.38 \times 1.8 \rightarrow \frac{238}{100} \times \frac{18}{10} = \frac{238 \times 18}{100 \times 10} \]
\[= \frac{4284}{1000} = 4.284\]

**Convert mixed unit measurements**

\[2\frac{1}{4} \text{ ft} = ____ \text{ in}\]

The tape diagram shows 1 foot divided into twelve equal parts. Each section represents 1 inch; therefore 1 inch is \(\frac{1}{12}\) of a foot.

9 inches = ____ ft

We rename 1 foot as 12 inches.

\[9 \text{ inches} = 9 \times 1 \text{ inch} = 9 \times \frac{1}{12} \text{ foot} = \frac{9}{12} \text{ ft} \text{ or } \frac{3}{4} \text{ ft}\]

Problem: A container can hold \(4\frac{1}{2}\) pints of water. How many cups can 2 containers hold? (1 pint = 2 cups)

\[4\frac{1}{2} \text{ pt} = \frac{9}{2} \rightarrow \frac{9}{2} \times 2 \text{ cups} = \frac{9 \times 2}{2} = \frac{18}{2} = 9 \text{ cups}\]

Two containers can hold 18 cups.

\[9 \times 2 = 18 \text{ c}\]

Dell has 35 marbles.